REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 41 to 67 and 76 to 78 are under active examination.

Amended claims

Claim 41 has been amended to clarify that step (i) of the claimed process involves "*dispersing in a treatment fluid a solid polymer capable of being converted by hydrolysis into one or more organic acids*". Incorporation of the solid polymer into the treatment fluid by dispersing it therein is described at page 16, lines 21 to 28 of the description as originally filed.

A person skilled in the art would also understand from step (iii) of the claimed process that the solid polymer is still present after it has been incorporated into the treatment fluid. Such incorporation is well known in the art to be a dispersion process, because the resulting composition is a mixture of a solid (the solid polymer) and a liquid (the treatment fluid). Still further, page 7, lines 22 to 28 of the text as originally filed describes that the "*hydrolysis of the polymer is by bulk erosion*" and that "*hydrolysis takes place at the surface of the polymer*". Accordingly, a skilled person would immediately understand that this means that the solid polymer must be dispersed in the treatment fluid rather than, for example, dissolved therein.

Applicant has made this amendment to claim 41 in view of US 7,080,688 B2 ("Todd"), which was recently cited by the Examiner on an Office Action issued on the divisional application (namely, US 12/222,865) derived from the present application.

Applicant has carefully reviewed the disclosure of Todd. In particular, Todd describes at column 2, lines 54 to 61 a process in which particulates coated with an acid-releasing degradable material are placed into a subterranean formation, whereupon the acid-releasing degradable material degrades to produce acid, which in turn contacts and degrades a portion of a filter cake.

According to Todd, it is essential to coat the acid-releasing material on a particulate material (such as sand, garnet, glass, ground walnut hulls, nylon pellets, ceramics, polymeric materials and the like; column 3, lines 25 to 31). Todd does not, therefore, disclose a process wherein a solid polymer capable of hydrolyzing into one or more organic acids is dispersed in a treatment fluid and then this treatment fluid is incorporated into an underground formation. Rather, in Todd the acid-releasing material must be coated onto a particulate and it is the coated

particulate that is then placed into the formation. The claims of the present application are therefore distinct from the processes described in Todd.

Furthermore, the subject-matter claimed in the present application, which involves dispersion of a solid polymer in a treatment fluid and does not involve coating of the solid polymer onto particulate materials, is also not suggested by Todd. It would not therefore be obvious to carry out the process of the present invention in view of Todd.

Still further, the claimed process has significant technical advantages over the process of Todd, which again could not obviously be derived from Todd. One such advantage is that, upon hydrolysis of the solid polymer according to the present invention, no unwanted material is left in the wellbore. In contrast, the process of Todd involves incorporation of further unwanted material (i.e., the particulate material itself). This could remain in the wellbore after degradation of the acid material or alternatively could require a larger quantity of acid-releasing degradable material to be present initially, to ensure disruption not just of the filter cake being targeted but also of the particulate material that has been simultaneously introduced into the formation.

The present claims are therefore neither anticipated, nor rendered obvious, by Todd.

Claims 41, 54, 55 and 61 have been amended to replace the English spelling of "hydrolyse", "hydrolysing" and "hydrolysed" by the corresponding American-English words "hydrolyze", "hydrolyzing" and "hydrolyzed". The use of the English spelling "fibre" in claim 50 has also been replaced by the American-English spelling "fiber".

Claims 44, 55 and 57 have been amended to place the lists recited therein into Markush form.

The term "(optionally)" has been deleted from claim 44.

Claim 59 has been amended to delete the term "optionally".

New dependent claim 77 has been added. This claim is based on previous claim 44. In particular, it recites the subject-matter that was set out as essential in previous claim 44, but omits subject-matter that was only "optional" in previous claim 44.

New dependent claim 78 has been added. This claim is based on previous claim 59. In particular, it recites the subject-matter that was set out as essential in previous claim 59, but omits subject-matter that was only "optional" in previous claim 59.

Continued Examination under 37 CFR 1.114

1. It is noted that the finality of the previous Office Action has been withdrawn and that Applicant's submission filed on 03/12/09 has duly been entered.

Claim Objections

2. The objection under this heading has clearly been met by the above-described amendment to claims 41, 54, 55 and 61.

Claim Rejections under 35 USC § 112

3-4. Examiner has rejected claim 44 as being indefinite for failing to use proper Markush form. Claim 44 has duly been amended to use Markush form. The rejection under this heading should therefore be withdrawn.

5. Examiner has rejected claims 44 and 59 as being indefinite, based on the use of the term "*optionally*". Amended claims 44 and 59 no longer recite the term "*optionally*" and so these claim rejections should also be withdrawn.

Claim Rejections under 35 USC § 102

6&7. Examiner has rejected claims 41-45, 51-58, 60-63 and 66 as being unpatentable over Harris *et al.* (WO 00/57022).

In response, it is noted that Harris relates to a method for treating an underground reservoir which comprises introducing into the reservoir a treatment fluid comprising an ester and a polymer breaker, such that the ester hydrolyzes to produce an organic acid to dissolve acid soluble material present within the reservoir and the polymer breaker degrades polymeric material present within the reservoir (page 3, lines 5 to 10; claim 1).

The nature of the ester contemplated in Harris can be understood by referring to the passages at page 5, line 29 to page 6, line 26, as well as Table 1 on page 17 and claims 9 and 10. For example, according to page 5, line 31 to page 6, line 1, particularly preferred esters are esters of ethanoic acid and methanoic acid. A general formula encompassing various preferred esters is then set out at page 6, lines 7 to 11. Specifically disclosed examples of esters falling within this general formula are 1,2,3-propanetriol acetate, 1,2,3-propanetriol diacetate, ethylene glycol diacetate, diethylene glycol triacetate and triethylene glycol diacetate (page 6, lines 12 to 13). According to page 6, lines 15 to 16, the ester can also be a cyclic ester such as lactone.

None of the esters specifically disclosed in Harris, or falling within the scope of the general formula on page 6, lines 7 to 11, is a polymeric material. In contrast, the claims of the present application all specify the use of a solid polymer capable of being converted by hydrolysis into one or more organic acids.

The reference in Harris at page 5, lines 29 to 31 to the esters preferably having a "*high flash point*" also indicates that the esters contemplated therein are liquids. That is because "flash point" is a property of a flammable liquid. The use of liquid esters in Harris can be contrasted with the requirement in the present claims for a solid polymer.

Still further, it is clear from the disclosure at page 6, lines 4 to 5 (specifying that the ester must be at least partially soluble in water) that Harris contemplates dissolving or dispersing the ester in an aqueous treatment fluid to form a fluid. Indeed, Example 1 makes clear at page 16, lines 10 to 11 that after addition of the ester and polymer breaker, the final treatment material to be injected into the formation is a fluid. In contrast, the claims of the present invention all specify a process having a step (iii) that involves allowing a solid polymer present in the treatment fluid to hydrolyze and hence disrupt a filter cake (i.e., the substance actually introduced into the wellbore is not a simple fluid, but is a heterogeneous mixture of a fluid and a solid polymer).

Harris clearly does not therefore disclose a process in accordance with the claims of the present invention, and in particular one which involves a solid polymer dispersed in a treatment fluid. It does not therefore anticipate present independent claim 41 or any of its dependent claims. Accordingly, it is submitted that the rejections under this heading should be withdrawn.

Claim Rejections under 35 USC § 103

8&9. Examiner has rejected claims 46-50 and 76 as being unpatentable over Harris and further in view of Willberg et al (US 7,265,079).

In response, Applicant submits that the subject-matter of independent claim 41 as amended, which has been shown in the foregoing paragraphs 6&7 to be novel over Harris, is also non-obvious over Harris in view of Willberg.

With reference to independent claim 41, Harris provides no suggestion of a process in which: (a) a solid polymer is dispersed in a treatment fluid; (b) the heterogeneous solid polymer/treatment fluid dispersion is introduced into an underground formation; and (c) the solid

polymer hydrolyzes to produce acid which disrupts a filter cake present in the formation. Rather, as explained above Harris describes a process whereby a non-polymeric, liquid ester is mixed with a treatment fluid and the fluid thus-obtained is introduced into an underground formation in order to disrupt a filter cake. There is no hint in Harris towards using a solid polymer in the way taught in the present application. On the contrary: Harris teaches that the specific combination of a liquid ester and a polymer breaker is necessary in order to disrupt a filter cake. It is therefore surprising in view of Harris that by adding a solid polymer of the invention to a treatment fluid one can arrive at a process that successfully disrupts a pre-existing filter cake in an underground formation.

Willberg fails to remedy the deficiencies in the teaching of Harris. As was explained in detail in the Amendment of 8 January 2009 filed in response to the previous Office Action, Willberg relates to generation of self-destructing filter cakes (column 1, lines 11 to 13). The composition used in Willberg comprises a mixture of a "solid acid-precursor" and a "solid acid-reactive material" (column 1, line 64 to column 2, line 7). This mixture is capable of forming a filter cake for use in oilfield applications. The solid acid-precursor then hydrolyzes in the presence of water to produce an acid, which dissolves the acid-reactive material to destroy ("self destruct") some or all of the filter cake.

The composition as defined in Willberg, for example in claim 1, would not even be suitable for exogenously disrupting a pre-existing filter cake in an underground formation. The reason is that the acid produced by hydrolysis of the "solid acid-precursor" according to Willberg is spent on the "solid acid-reactive material" (i.e., the other essential feature of the invention), as it is produced. The composition consequently self-destructs, but does not substantially disrupt a filter-cake other than the composition itself. In this respect, the acid according to Willberg acts as an internal breaker.

A person of ordinary skill in the art would recognize that the respective teachings of Harris and Willberg are fundamentally incompatible. Harris is concerned with provision of a treatment fluid that can exogenously disrupt a filter cake present in an underground formation. Willberg provides a composition that actually forms a filter cake, albeit one that internally degrades over time. The Willberg composition would not even be capable of disrupting a pre-existing filter cake, which is the precise aim of Harris.

Furthermore, Harris clearly indicates to a skilled worker that disruption of a pre-existing filter cake is achieved by using a material which is a fluid, not one which contains solids such as, for example, the "solid acid-precursors" of Willberg. For example, it is stated at page 14, lines 13 to 19 of Harris that in at least one embodiment the fluid can penetrate up to several meters into a carbonate formation around a wellbore behind a fracture face. Clearly that degree of penetration would not be possible were the reactive material present as a solid rather than as a fluid. This provides further evidence that a skilled worker would not consider using a solid acid-precursor in place of the fluidic esters taught by Harris.

The process of the present invention also has significant technical advantages when compared to the process taught in Harris, which would not have been obvious from Willberg. One such advantage is that, at a given temperature, the rate of acid production obtained from the solid polymers is generally lower than obtained when esters present in a solution are used. This makes the solid polymers inherently more suitable for acidizing wellbores at higher temperatures or for slow-rate acidization of filter cakes at lower temperatures, where a more rapid release of acid could result in faster breakage of filter cake than is required for a particular completion operation. Accordingly, the specific process of the present invention can be desirable under numerous important wellbore operations, including those specifically mentioned at page 17, lines 17 to 25 of the present description. These surprising advantages provide yet another indication of the inventiveness associated with the claimed subject-matter.

It is therefore submitted that the subject-matter of independent claim 41 would not have been obvious from Harris or from Harris in view of Willberg. Furthermore, all of the dependent claims (including claims 46-50 and 76) depend on claim 41 and therefore derive their patentability from it. Accordingly, Applicant submits that the subject-matter of these claims must also be non-obvious over Harris in view of Willberg. It is therefore believed that the rejection over this combination of documents can be withdrawn.

10. The Examiner has further rejected claim 59 as being unpatentable over Harris as applied to claim 41 above and in view of WO 01/02698 ('698).

In response, Applicant submits that the subject-matter of claim 41 is non-obvious over Harris in view of '698. The discussion in the foregoing paragraphs 8&9 establishes that the claimed subject-matter is non-obvious over Harris itself.

Like Willberg, also discussed in paragraphs 8&9, '698 fails to remedy the deficiencies in the teaching of Harris. In particular, '698 teaches a method for treating an underground reservoir by introducing a treatment liquid comprising an ester and a non-enzyme catalyst capable of increasing the rate of hydrolysis of the ester. Hydrolysis of this ester produces an organic acid to dissolve acid soluble material present within the reservoir.

The esters disclosed in '698 are non-polymeric liquids (see, for example, the specific esters listed on page 4, lines 17 to 23 and in claim 11), whereas the organic acid producing material used in the present invention is a solid polymer. In addition, '698 teaches that the specific combination of a liquid carboxylic acid ester such as a methanoic or ethanoic acid ester and a non-enzyme catalyst is necessary in order to achieve acid production at a sufficiently high rate to disrupt a filter cake. It is therefore surprising in view of '698 that by dispersing a solid polymer of the invention in a treatment fluid one can arrive at a process that successfully disrupts a pre-existing filter cake in an underground formation. A person of ordinary skill in the art would not therefore have been able to derive the present invention from '698.

Furthermore, as is clear from the foregoing discussion, the fundamental deficiencies in the teaching of Harris and '698 are basically the same. In particular, neither document provides any suggestion of a process in which: (a) a solid polymer is dispersed in a treatment fluid; (b) the solid polymer/treatment fluid dispersion is introduced into an underground formation; and (c) the solid polymer hydrolyzes to produce acid which disrupts a filter cake present in the formation. Accordingly, the subject-matter of present claim 41 is not rendered obvious by this combination of documents.

Dependent claim 59 depends on claim 41 and therefore derives its patentability from it. Accordingly, Applicant submits that the subject-matter of claim 59 must also be non-obvious over Harris in view of '698. It is therefore believed that the rejection over this combination of documents can be withdrawn.

11. The Examiner has further rejected claims 64 and 65 as being unpatentable over Harris as applied to claim 41 above.

Applicant notes that Examiner's arguments rely on it being allegedly well known within the art to use crosslinked guar gum to viscosify a fluid. However, Examiner's arguments are rendered moot because dependent claims 64 and 65 depend on claim 41 and therefore derive

their patentability from it. In that regard, the discussion in the foregoing paragraphs 8&9 establishes that the subject-matter of independent claim 41 is non-obvious over Harris. Accordingly, it is submitted that the rejection under this heading can also be withdrawn.

12. The Examiner has further rejected claim 67 as being unpatentable over Harris as applied to claim 41 above and in view of Constien (US 6,831,044).

In response, Applicant submits that the subject-matter of claim 41 is non-obvious over Harris in view of Constien. The discussion in the foregoing paragraphs 8&9 establishes that the claimed subject-matter is non-obvious over Harris.

Constien does not disclose or suggest the process defined in claim 41. In particular, Constien teaches protective screen coatings comprising a binder that contains a "reactive material". The reactive material can be any of a very wide range of materials, including enzymes, chelants, acids, surfactants, oxidisers or free radical generators, corrosion inhibitors, scale or paraffin inhibitors or "other specific chemicals as called for by a particular well condition" (column 6, lines 39 to 43). After placement of the screen, the binder dissolves or melts and thus releases the reactive material. There is no reference in Constien to use of a treatment fluid of any sort, and still less of a treatment fluid in which a solid polymer has been dispersed. Thus, Constien indicates that a solid polymer, if it is to be used at all, should be incorporated into a binder forming a solid coating on a screen.

In view of the above it will be clear that neither Constien nor Harris suggests a process in which: (a) a solid polymer is dispersed in a treatment fluid; (b) the solid polymer/treatment fluid dispersion is introduced into an underground formation; and (c) the solid polymer hydrolyzes to produce acid which disrupts a filter cake present in the formation. A skilled worker would not therefore have been able to derive the process of claim 41 from a combination of the respective teachings of Harris and Constien. Applicant therefore submits that the subject-matter of claim 41 is non-obvious over these documents.

Claim 67 depends on claim 41 and thus derives its patentability from that claim. Accordingly, for the reasons discussed above in relation to claim 41, Applicant submits that the subject-matter of claim 67 is also non-obvious over Harris and Constien. It is therefore believed that the rejection over this combination of documents can be withdrawn.

Favorable reconsideration and withdrawal of the outstanding objections and rejections is believed to be in order and is respectfully requested.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____
Arthur R. Crawford
Reg. No. 25,327

ARC:eaw
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100